## Space Weather Forecast

Issued on Sunday, 24 September 2023 at 01:25 Local

**This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales**

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**Space Weather Forecast Headline: Isolated Moderate flares likely, with a slight chance of Strong flares (R1-R3 Radio blackouts). Chance of G1-G2 minor/moderate geomagnetic storms, most likely Day 1 (24 Sep).**

**Analysis of Space Weather Activity over past 24 hours**

**Solar Activity:** Moderate with one Moderate flare observed from over the northwest limb at 23/2043 UTC. Frequent common class flares were also observed, with the strongest from the developing sunspot in the southeast. This was the most active region on the disc, with a complex magnetic field developing due to mixed magnetic polarities developing close together. There are a total of eleven sunspot regions on the disc, with moderately sized regions persisting in the northwest and in the north-centre disc, although less active than recent days. The other main developmental region is located in the west disc, however this persisted as a small and largely inactive spot

A couple of weak CMEs (coronal mass ejections) were observed, including from one of the larger common class flares, however these were all assessed as missing Earth.

**Solar Wind / Geomagnetic Activity:** Slow wind conditions persisted with solar winds at background speeds, around 370-320 km/s. The Interplanetary magnetic field strength (IMF) was weak, with the north-south component also weak but predominately negative (southward). Resultant geomagnetic activity was Quiet to Unsettled (Kp 1-3).

**Energetic Particles / Solar Radiation:** The count rate of energetic particles (high energy protons) remained at background with no Solar Radiation storms observed.

**Four-Day Space Weather Forecast Summary**

**Solar Activity:** Forecast to persist at Moderate with further isolated Moderate flares likely. There is also a slight chance of rising to High due to the potential for isolated Strong flares from the sunspot in the southeast. .

**Solar Wind / Geomagnetic Activity:** CME arrivals are possible through much of the period, with the most significant from the long lasting Moderate flare early on 22 Sep, likely arriving day 1 (24 Sep). Confidence is low however, with a glancing impact most likely. There are also other possible weaker glancing impacts. This includes the CMEs from the Moderate flares on 20 Sep (perhaps glancing early day 1) and 21 Sep (perhaps glancing later day 1 or day 2, 24-25 Sep). These may all combine to a single arrival however. Beyond this, there are a couple of further weak arrivals possible, from weak CMEs observed on 22 Sep. These have a chance of arriving giving a combined but glancing arrival on day 2 and into day 3 (25-26 Sep), however this is very low confidence. In the absence of any CME arrivals, mainly slow background winds are expected to persist. Geomagnetic activity is expected to be Quiet to Unsettled at first, but likely increasing to Active to G1 Minor Storm, with a chance of G2 Minor Storm intervals, with any CME arrivals, most likely day 1 (24 Sep), with a lower chance day 2-3 (25-26 Sep). This brings a low chance of visible aurora to northern parts of the UK, mainly days 1-2 (24-25 Sep)

**Energetic Particles / Solar Radiation:** The count rate of energetic particles (high energy

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protons) is forecast to remain at background with no Solar Radiation storms occurring.

**Geomagnetic Storms:**

| Geo-Magnetic Storm Probability (Exceedance) | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Minor or Moderate | G1 to G2 | No | 40 | 30 | 20 | 5 |
| Strong | G3 | No | 10 | 5 | 1 | 1 |
| Severe | G4 | No | 1 | 1 | 1 | 1 |
| Extreme | G5 | No | 1 | 1 | 1 | 1 |

**Radio Blackouts - X Ray Flares:**

| X Ray Flares Probability | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | R1-R2 M Class | Yes | 75 | 70 | 60 | 60 |
| Very Active | R3 to R5 X | No | 20 | 20 | 15 | 10 |

**Solar Radiation Storms - (High Energy Protons):**

| Radiation Storms Probability (Exceedance) | Level ($cm^{-2}$ $sr^{-1}$ $s^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | ≥ S1 | No | 15 | 15 | 10 | 10 |
| Very Active | ≥ S3 * | No | 1 | 1 | 1 | 1 |

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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